CLAIMS

1. A cathode sub-assembly for an ion source comprising:

an indirectly heated cathode; and

a support rod fixedly attached to the indirectly heated cathode for supporting the cathode within an arc chamber of the ion source.

2. The cathode sub-assembly as defined in claim 1 wherein the support rod is attached to a surface of the cathode facing away from the arc chamber.

3. The cathode sub-assembly as defined in claim 2 wherein the cathode is in the shape of a disk.

4. The cathode sub-assembly as defined in claim 3 wherein the support rod is fixedly attached at or near the center of the cathode, along an axis of the cathode.

5. The cathode sub-assembly as defined in claim 4 wherein the support rod is in the shape of a cylinder and the diameter of the cathode is larger than a diameter of the support rod.

6. The cathode sub-assembly as defined in claim 5 wherein the diameter of the cathode is at least four times larger than the diameter of the support rod.

7. The cathode sub-assembly as defined in claim 5 further comprising a spring loaded clamp for holding the support rod.

8. The cathode sub-assembly as defined in claim 1 wherein the support rod mechanically supports and conducts electrical energy to the cathode.

9. A cathode assembly for use in an indirectly heated cathode ion source which includes an arc chamber housing that defines an arc chamber, comprising:

a cathode sub-assembly, including a cathode and a support rod fixedly mounted thereto; and

a filament for emitting electrons, that is positioned outside the arc chamber in close proximity to the support rod of the cathode sub-assembly; and

a cathode insulator for electrically and thermally isolating the cathode from an arc chamber housing, that is disposed around the cathode of the cathode sub-assembly.

10. The cathode sub-assembly as defined in claim 9 further comprising a filament disposed around the support rod in close proximity to the cathode and isolated from a plasma in the arc chamber.

11. The cathode sub-assembly as defined in claim 9 further comprising a filament disposed around the support rod in close proximity to the cathode and isolated from a plasma in the arc chamber, wherein the filament is fabricated of an electrically conductive material and includes an arc-shaped turn having an inside diameter greater than or equal to the diameter of the support rod.

12. The cathode sub-assembly as defined in claim 9 further comprising a filament disposed around the support rod in close proximity to the cathode and isolated from a plasma in the arc chamber, wherein the filament is fabricated of an electrically conductive material and includes an arc-shaped turn having an inside diameter greater than or equal to the diameter of the support rod, and wherein a cross-sectional area of the filament varies along a length of the filament, and is smallest along the arc-shaped turn.

13. The cathode assembly of claim 9 wherein said cathode insulator includes an opening having a diameter that is larger than or equal to the diameter of the cathode.

14. The cathode assembly as defined in claim 13 wherein a vacuum gap is provided between the cathode insulator and the cathode to limit thermal conduction.

15. The cathode insulator of claim 13 wherein said cathode insulator has a generally tubular shape with a sidewall and includes a flange, for shielding the sidewall of the cathode insulator from a plasma in the arc chamber.

16. The cathode insulator of claim 15 wherein said flange is provided with a groove on a side of the flange facing away from the plasma, for increasing a path length between the cathode and the arc chamber housing.

17. A method for supporting and indirectly heating a cathode of an ion source comprising steps of:

supporting the cathode by a rod fixedly attached to the cathode; and

bombarding the cathode with electrons.

18. A cathode assembly for an ion source comprising:

a cathode;

a support rod fixedly attached to the cathode; and

a cathode insulator for electrically and thermally isolating the cathode from an arc chamber housing; and

an indirect heating means for indirectly heating the cathode.